LIVERMORE BRIDGE
National Covered Bridges Recording Project
Spanning Blood Brook at Russell Hill Road
Wilton
Hillsborough County
New Hampshire

HAER NH-43
NH-43

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECHORD

LIVERMORE BRIDGE

HAER No. NH-43

LOCATION:	Spanning Blood Brook at Russell Hill Road, Wilton, Hillsborough County, New Hampshire UTM: 19.272911E.4745583N, Greenville, NH Quad
DATE OF CONSTRUCTION:	Rebuilt or substantially repaired in 1937
FABRICATOR:	Unknown
PRESENT OWNER:	Town of Wilton, New Hampshire
PRESENT USE:	Highway bridge
SIGNIFICANCE:	Livermore Bridge is one of only seven known boxed pony trusses in North America. Of the two Town lattice examples, only the Livermore Bridge is a half-through boxed pony.
HISTORIAN:	Dr. Mark M. Brown, August 2003
PROJECT INFORMATION:	The National Covered Bridges Recording Project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is administered by the Historic American Buildings Survey/Historic American Engineering Record, a division of the National Park Service, U.S. Department of the Interior. The Federal Highway Administration funded the project.

> Wilton citizens voted unanimously for the resolution thanking Mrs. Francis J. Moors for her efforts and expenditure of $3502.16 for rebuilding the damaged Livermore bridge and preserving this old Wilton landmark.
> -*Milford Cabinet*, March 10, 1938.[1]

Marjorie Standish Moors, nee Devlin, was a remarkable person. More than a widow of a Boston stockbroker, more than one of the many "summer people" with second homes in Wilton Center and the Town of Wilton in general, she took an active interest in the people and community around her.[2] On her death in 1962 she left substantial bequests to long-term staff of her Wilton Center estate, the First Unitarian Congregational Church of Wilton Center, and numerous animal charities.[3]

While such interests may have been common or even expected of a widow in her position, Moors also took an interest in the crossroads just below Wilton Center where she owned property. In the eighteenth, nineteenth, and probably well into the twentieth century, two roads ran down the hill from Wilton Center and crossed what is now called Blood Creek. From there the road, now known as Russell Hill Road, ran along the heights in early New Hampshire fashion to what are now the Towns of New Ipswich and Greenville.[4] In the late 1700s, Rev. Jonathon Livermore built a dam and a sawmill just above the Blood Creek-Russell Hill Road crossing. Besides her role in the bridge, Moors also preserved the sawmill and had its masonry dam repaired after the floods of 1936.[5]

The newspaper accounts and town reports are tantalizing, but unclear, about the extent of the work on the Livermore Bridge that Mrs. Moors financed. The *Milford Cabinet*, quoted above, speaks of "rebuilding" and "preserving," but town records speak of "bridge construction."[6] When it comes to fiscal expenditure, the records are clear: Fred Tuttle and Nehe Pajanen were paid $3278.11 and $224.05 for labor and materials, respectively.

Tuttle, a WWI Army veteran, was a carpenter like his father. Together with his brothers, he built many houses in Hillsborough County, New Hampshire. His heirs sold his house and disposed of his papers, so the extent of his bridge building work remains unknown. Whether he repaired or built *de novo*, Tuttle left a remarkable structure worthy of a century of lattice bridge construction

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[1] "Burke and Lenz Win," *Milford Cabinet*, (Milford, New Hampshire), March 10, 1938, p. 8.
[2] "Why the State Road Goes Through Wilton Center," *Milford Cabinet*, September 6, 1917.
[3] "Bequests Listed as Will of Mrs. Francis J. Moors is Filed," unsourced clipping, November 1, 1962, *Rideout Scrapbooks*, vol. 9, p. 312, in Wilton Historical Society, Wilton & Gregg Free and Public Library, Wilton, New Hampshire, hereinafter cited as *Rideout Scrapbooks*. Special thanks to Phyllis Tellarico (Curator), Jane Bergeron, and Stanley Young for their help with the Wilton Historical Society's collections.
[4] J. Chase, *Map of Hillsborough County, New Hampshire* (Boston: Smith, Mason & Co, 1858).
[5] "Wilton's River Gave Town Its Start," *Rideout Scrapbooks*, vol. 9, p. 381; "Rebuild Old Dam," Oct. 1936, *Rideout Scrapbook*, vol. 1, p. 419;"Repair Ancient Dam," September 1937, *Rideout Scrapbook*, vol. 1, p. 212.
[6] *Annual Reports of the Town Officers*, January 31, 1938, pp.16, 31, in Town Clerk's Office, Town Office, Wilton Village, New Hampshire.

and of Moors' benefaction.[7]

The Livermore Bridge is the only known example of a timber, half-through, pony lattice truss in North America. Crossing Blood Brook at an almost north-south axis, the 52' -3" long bridge, measured from outside edge to outside edge of the truss siding, forms a dangerous "T" intersection with State Route 101. The abutments are irregular granite blocks. Granite faced concrete wings dating to the 1990s project from the old abutments and support the bottom chords. A dry-masonry ramp made of mid-sized granite boulders supports the Russell Hill approach.

The approximate dimensions of the truss sheathing, exclusive of the galvanized standing seam "roof" covering, are 8'-11" x 2'-3-1/2".[8] Because the standing seam metal "roof" and the vertical siding both protect and conceal the top chords, it is not possible to determine if the top chords are identical to the four 3" x 12" bottom chords. Lattice members are 3" x 10" with two 2" diameter trunnels per web intersection. Three trunnels secure the connections at the bottom chord. A distinctive feature of the bridge is the middle chord, consisting of two 14-3/4" -15-3/4" x 3" planks that support 6" x 12" x 20' deck beams. Numerous close, but unevenly spaced, 3" thick stringers support the 16'-1" long deck planking. The two systems, namely knee braces and lower-lateral bracing stabilize the structure against racking and horizontal sway. Knee braces, with bird's mouth notches on one end to accommodate the bottom chord and toe nailed into the deck beams on the other end, are approximately 3" x 6" or a bit smaller. The lateral bracing system is made of 1" diameter wrought-iron rods with forged eyes and rings.

Except for the loss of a section at the northwest end of the bottom chord caused by rot and an epoxy and steel-plate repair, the visible sections of the bridge seem in remarkable condition.

The bridge is currently posted for 6 tons and restricted to passenger vehicles. Russell Hill Road is being rerouted to a new crossing substantially downstream. The new bridge will permit emergency vehicle access to a new development project along Russell Hill Road without replacement or substantial alterations to the Livermore Bridge.

Inspection of the bridge yields limited insight into the confusion over the extent of Tuttle's 1937 work. As is often the case with timber bridges, the planking, stringers, deck beams, and knee

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[7] Ella Quinn, Sister of Frank Tuttle, telephone communication with author, June 19, 2003; Lee Tuttle, Nephew of Frank Tuttle, telephone communication with author, June 30, 2003. Little information is available on Nehe Pajanen other than he worked with Tuttle.

[8] The siding prevents a more accurate measurement of the truss depth and prevents inspection of the top chord. An untitled memo by Charles O. McGettigan, Jr., Highway Agent for the Town of Wilton, 1980-1999, in "Correspondence Files," Town of Wilton, New Hampshire Department of Transportation, Morton Building, Concord, New Hampshire has the following entries:

#1 Flashing replaced by Wilton & Lyndeborough Coop High School Shop Class in the mid 1970'S [*sic*]
#2 9 6" x 12" x 20' Stringers replaced in 1975
#3 13 6"x 12" x 20' Stringers replaced in 1992
#4 All the sub deck and top placing was replaced in 1992 also
#5 New concrete foundations were installed under both ends of bridge so that new masonry piers could be built to support the ends of the bridge that had deteriorated. This work was done in the early 1990'S [*sic*]

braces, being intentionally expendable, are of comparatively recent vintage. The lattice members possess a remarkable uniformity of finish and show no evidence of repairs. This might be attributed to an initial or subsequent creosote treatment.[9] This uniformity also raises the possibility that they are Tuttle's work and not reused from an earlier structure damaged by flood. On the other hand, the innermost timber of the upstream middle chord does have a different finish (perhaps it is unplaned or cut with a vertical saw) suggesting either a different source or a replacement.

The history of the Town lattice has been documented extensively elsewhere.[10] Patented in 1820 by Ithiel Town, the lattice truss bridge type uses a network of diagonal planks pinned together at their intersections and further secured by horizontal chords of the top and bottom of the truss. Pinned connections eliminated complicated joint carpentry found in other types of timber bridges. The high structural redundancy of the Town truss reduced loads in the individual members and had the additional advantage of distributing loads throughout the structure in case of local failure. Lattice trusses in timber were widely used in New England, and metal versions were popular Europe.

In light of the properties of the Town lattice, a carpenter of Tuttle's extensive experience should not have had particular difficulty constructing or repairing the Livermore Bridge. It is an open question whether he designed it or copied the remains of a damaged bridge. New Hampshire had many examples of lattice trusses available for his inspection in 1937. The Boston and Maine Railroad built the three other surviving ponies in New Hampshire. Further research may show whether the Livermore Bridge is a rare survivor of a once common type or a rare survivor of a rare variant of a common type.[11] Whichever the case, the Livermore Bridge is the only

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[9] Charles O. McGettigan, Jr., Highway Agent for the Town of Wilton, 1980-1999, personal conversation with author, June 19, 2003.

[10] Carl W. Condit, *American Building Art: the Nineteenth Century* (New York: Oxford University Press, 1960), pp. 88-92; Gregory K. Driecer, "The long span. Intercultural exchange in building technology: Development and industrialization on the framed beam in Western Europe and the United States, 1820-1870" (Ph.D. diss., Cornell University, 1993), chapter 3, especially pp. 109-110, 113, 123, 150.

Milton S. Graton, noted covered bridge builder and conservator, disagrees, however, with the often-made assertion that the Town lattice requires smaller timbers. On the contrary, he convincingly argues, that the "Town Lattice requires LARGER trees or logs." See Milton S. Graton, *The Last of the Covered Bridge Builders* (Plymouth, New Hampshire: Clifford-Nicol, Inc., 1986), p. 10.

For more on the Town lattice, see also "Cornish-Windsor Bridge," HAER No. NH-8. For an example of the Town lattice in a railroad context, see "Contoocook Railroad Bridge," HAER No. NH-38. "Brown Bridge," HAER No. VT-28, includes an engineering analysis of a Town highway bridge, while "Bath-Haverhill Bridge," HAER No. NH-33, considers the Town lattice supplemented with an arch.

[11] The New Hampshire Department of Transportation has an interesting drawing in its files entitled "Proposed Repairs to Old Wooden Bridge over the Souhegan River, Wilton, New Hampshire" that is dated April 1908. The drawings are labeled "Charles E. Walbridge, Bridge Contractor, Plymouth, N.H." While it is clear that the drawings are not for the Livermore Bridge -- Blood Brook is a tributary of the Souhegan River -- the drawings are of interest nevertheless. They feature a half elevation of a lattice truss, an end view of the truss, a top view of the bottom chord, and a partial plan of the subdeck. Individual members are virtually identical in section to those currently on the Livermore Bridge: lattice members are 3" x 11", top and bottom chord members are 3" x 12", and the middle chord is composed of 3" x 15" planks. What is different is that the drawing shows substantially more planks in the chords, namely: eight versus four in the bottom chord and four versus two for the middle chord. The drawing also shows six planks in the top chord and raises the possibility that the Livermore Bridge also has fewer members in the

remaining highway timber pony truss in New Hampshire.

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top chord than in the bottom. Unlike the current situation at Livermore, the drawing shows no preexisting lower lateral bracing. Rather, it records the proposed installation of such a system based on the Howe truss. Looking at the drawing clearly shows that the Souhegan River Bridge was more substantial, whether for greater load or span is unclear, than the Livermore Bridge. Finally, the drawing shows that the Livermore Bridge has not always been a unique example of the half-through Town lattice.

Joseph Conwill, *Editor of Covered Bridge Topics*, telephone conversation with author, July 29, 2003, reports that a study of covered bridges in Québec documented the construction of a total 950 bridges. Of these, seventy-two were pony trusses. If the proportion of ponies to through trusses in the United States was anywhere similar to that in Québec, the losses in this country have been truly staggering. At the time of this writing, the remaining example in Québec, and all of Canada, is on the verge of collapse. See Gérald Arbour and Gaétan Forest, *Les ponts couverts du Québec: d'hier à aujourd'hui* (N.P.: Société québécoise des ponts couverts, 1988, revised 2003).

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